quarters of the globe, with a supplementary chapter on Nature and Man as agents of change. The second part is descriptive of the commercial products of the Vegetable Kingdom, in which Meyen's plan appears again to have been followed in the main; it is subdivided into Food Plants, and Industrial and Medicinal Plants. In the third part we have, in like manner, the commercial products of the Animal Kingdom; and, in the fourth, raw mineral products. The comments which we have to make are almost confined to errors of omission which can be readily rectified in future editions. We regret to see still retained the antiquated classification of the Animal Kingdom into Vertebrata, Mollusca, Annulosa, Radiata, and Protozoa. The sentence by which (p. 260) the porcupine and the ant-eater are made members of the order Monotremata, is no doubt merely an oversight. Among food plants, it is strange to find no mention made of the potato, nor, indeed, of any of our culinary vegetables, the cabbage, turnip, or carrot, with the single exception of the onion! We demur to the assertion that the morel is "one of the few fungi found in this country which may be eaten with safety;" among these few we do not understand why the truffle and the morel only are given, the mushroom not being even alluded to. Indeed, the whole subject of Vegetable Products requires revision, many being entirely omitted of much greater importance than others to which considerable space is allotted. Among Industrial Plants, for instance, we should expect to find some description of the numerous fibres now used in the manufacture of paper, the esparto-grass, different kinds of wood, &c., which are daily becoming more important articles of commerce. An exceedingly useful vocabulary is appended, containing the names of natural productions in the principal European and Oriental languages; and the volume may be safely recommended as containing an immense mass of useful information on a very important subject.

Record of American Entomology for the year 1869. Edited by A. S. Packard, Jun., M.D., 8vo. (Salem, 1870. London: Williams & Norgate.)

THIS is the second annual analysis of the literature of American Entomology which has been published under the care of Dr. Packard. It must be gratifying to entomologists to find that their science is so popular in the United States as to render the production of such a work at all feasible, and we can only hope that the Editor may receive sufficient support to enable him not only to continue it in its present form, but even to enlarge it and make it still more useful. Of course, with the general entomologist, this Record can never take the place of the entomological portion of the *Zoological Record* which has been brought out in this country since 1865, but it is of the greatest value in giving the European naturalist intimations of papers and descriptions published in those out-of-the-way American periodicals which rarely fall into his hands.

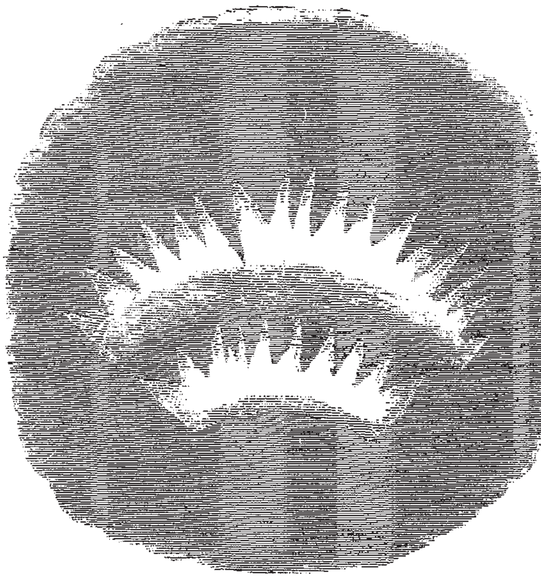
W. S. D.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his Correspondents. No notice is taken of anonymous communications.*]

The Aurora Borealis by Daylight

I HAVE been expecting ever since the great display of Tuesday, Oct. 25, to see some statement that the Aurora was visible on the afternoon of that day. I was in Huntingdonshire, about four miles from Kimbolton, at the time, and being out of doors at half-past four P.M., saw a remarkable pale luminous appearance some 25° above the horizon and almost due east. At this point there were two arcs of faint white lines, one above the other, both radiating outwards with a number of short points. The breadth of the upper arc (which was rather the widest) might be from twelve to twenty times the apparent diameter of the moon. It was of course broad daylight at the time, and the sky was perfectly clear and cloudless for a long distance round these patches of light. They were visible for at least ten minutes, brighter and fainter alternately, and were seen by a friend as well as myself. I was unfortunately called away, and prevented from watching them while the sky became darker. After dark (at 5.30) they had disappeared, but the dark irregular circle mentioned by Mr. Grove, from which the streamers radiated, was extremely conspicuous. It did not strike me at the time that the appearance at 4.30 was likely to have any special interest. But as it seems that the greatest disturbance of the telegraphs happened before the *evening* display of the aurora, it may perhaps be of use to record that it was also visible in the latter part of the afternoon.



26, Finsbury Place, E.C.

JAMES CUBITT

The Spectrum of the Aurora

THE following observations on the Spectrum of the Aurora were made by Mr. Alvan Clark, jun., in the neighbourhood of Boston, on the evening of October 24. He used a chemical spectroscope of the ordinary form, with one prism, and photographed scale illuminated with a lamp. Four lines were seen at the points marked 61, 68, 80, and 98. To reduce these to wave-lengths, the next day I measured the lines C, D, E, b, F, and G with the same instrument, and deduced the annexed table:—

Line.	Reading	Wave-length	Assumed Line.	Comments.	Error.
C	49·1	656			
D	57·8	589			
(1)	61	569	557	Common Aurora Line	— ·2
(2)	68	532	531·6	Corona Line?	+ ·1
E	69	527			
b	71·2	517			
F	79·7	486			
(3)	80	485	486	F Hydrogen.	— ·3
(4)	98	435	434	G "	+ ·6
G	100·5	431·2			

The first column gives the name of the line; the second the readings on the scale; the third its wave-length, obtained from Angström's chart, and by interpolation; the fourth the wave-length of the line with which these lines are supposed to be identical. The fifth column gives the name of this line, and the sixth the error in parts of the scale. The first measure is evidently wrong, and should probably have been 63. For the other three, however, the agreement is remarkable, two coming close to F and G of hydrogen, the other to the line observed

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by Professor Young in the solar corona. The lines C and F having already been observed, the discovery of the line G seems to render certain the existence of this gas in the Aurora. The common methods of interpolation were not available for computing the wave-lengths of column three, on account of the large interval between the lines. A curve was therefore constructed, in which vertical distances represented scale-readings, and horizontal distances the square of the reciprocal of the wave-lengths. This, by the formula of Cauchy, should be very nearly a straight line, giving, consequently, results of great accuracy.

EDWARD C. PICKERING

ON the evening of Monday, October 24, a very remarkable auroral display was observed in New York City. In the north at first was an obscure segment, low towards the horizon, surmounted by a pale glow of light. Later, this was replaced by an extensive manifestation of beautiful streamers.

But the most notable part of the phenomenon was a band of brilliant red light, varying in its different parts constantly throughout the evening, in brilliancy, definition, and breadth, but in general some ten degrees wide. It was seen early in the evening, and could be traced from within fifteen degrees of the horizon in the east and the west, extending entirely across the sky, south of the Zenith.

The position of this rosy band viewed from the south-east corner of the Central Park, was from 8¼ to 8½ p.m., New York City mean time, about as follows.

In the east, just above the horizon, passing almost centrally, and diagonally through the figure of *Cetus*, say between δ and ζ Ceti; thence going westward it lay between *Piscis occidentalis* and γ *Aquarii*, and between *Altair* and *Delphinus*, often expanding in width beyond these boundaries. Thence it extended westward to the stars in the heads of Hercules and Serpentarius nearly to the horizon.

In all its splendid variations throughout the evening, it maintained its position in regard to the horizon of the observer standing in the locality before mentioned, the diurnal motion of the earth carrying the stars past it.

On the following evening the exhibition of this red band, in the same position, was at least equally pronounced; but without any decided boreal light, so far as I have noticed or learned.

I would also here mention the very brilliant display of variously tinted auroral streamers which engaged the admiration of members of the American Association for the Advancement of Science, as they returned by the steamer on the Hudson to the city of Troy, from their visit to Albany, from ten to eleven o'clock on the evening of Friday, August 19, 1870. JAMES HYATT

Honey Brook, Stanfordville P.O., New York

Early Mentions of the Aurora Borealis

YOUR correspondent, Mr. Earwaker, should have mentioned that the list of appearances of the Aurora Borealis given in M. de Mairan's work is chiefly derived from another enumeration in Prof. Frobes's "Nova et Antiqua Luminis atque Auroræ Borealis Spectacula," Helmstadii, 1739. On reference to this list it immediately appears that it is very little to be relied upon for displays previous to the year 1707 or thereabouts. Some of the appearances recorded rest on no good authority, others were obviously meteoric; some occurred within the Arctic circles, others are entered twice over from inadvertence, or a neglect to allow for the difference of style; more than twenty are recorded on the authority of the meteorological diary kept at Breslau by Grebner, who in fact says nothing more than that on those occasions the night was somewhat bright (*sublustris*). When the necessary deductions on these accounts have been made, it will be found that the infrequency of the phenomena prior to 1707, and its extraordinary development since that date, are well-established facts. They are strongly insisted upon by M. de Mairan himself, who does not produce more than five instances of the aurora in France during the whole of the seventeenth century, and shows from the evidence of a missionary that it was unknown or forgotten in China until 1718. All contemporary notices prior to about this period, attest the astonishment with which it was regarded.

From the following curious passage in Sirr's "Ceylon and the Cingalese" (vol. ii. p. 117), it would appear that the aurora, or something resembling it, is occasionally visible in Ceylon:—

"There is a heavenly phenomenon which appears occasionally in Ceylon, called by the natives Buddha lights; this faintly resembles the Northern Lights, and is extremely resplendent. The priests declare this to be a sign of Buddha's displeasure when his followers have become sinful in the extreme, and that the light appears over the wihare, from whence the priests suppose the phenomenon to emanate, where those who have committed the sin which has aroused the god's anger last worshipped."

London, November 19 R. G.

IN many parts of Ireland a scarlet aurora is supposed to be a "shower of blood." In 1854 while stationed at Bearhaven, County Cork, a scarlet aurora that then appeared was said to be the blood of the people that were slain at Balaclava. About two years ago, while driving between Oughterard and Clifden, at two o'clock in the morning, there was a magnificent scarlet aurora (by far the most brilliant I ever saw), on which the car-driver remarked, "I wonder, can that be the blood of the Americans?" The late aurora is said to be the blood of the Frenchmen.

In the old Annals showers of blood are recorded at different times, always in connection with a great battle or the murder of some great chief. The earliest I can remember is that of A.D. 688, in the "Annals of Cloonmacnoise," after a battle of the Leinster-men and Ossory-men (now in the King's County, but formerly in Munster), wherein Foylcher O'Moyloyer was slain. This battle and shower of blood in the "Annals of the Four Masters," is said to have happened in the year A.D. 690. These Annals also mention that butter was turned into the colour of blood and a wolf was heard to speak; while the Annals of Tighernach place the battle in A.D. 693, and say that the blood flowed in streams for three days and three nights. During the aurora I saw about two years ago, and the two nights that the last aurora was seen here, the lakes and rivers looked to be full of blood. Therefore I should imagine the aurora of 688 must have lasted three nights, and that the people who saw it and recorded it must have had butter for supper the night it was seen, which reflected the colour. G. HENRY KINAHAN

Geological Survey of Ireland,
Connemara, Nov. 26

Prismatic Structure in Ice

THE following extracts from a letter from Mr. Langton (whose name was, unfortunately, misread as Langters in sending his former letter to the press) may interest others as much as it has done myself, if space can be found for it in your columns. In that case, perhaps, you will kindly allow me to say a few words in reply on a future occasion.

St. John's College, Cambridge T. G. BONNEY

"I admit with you that the prismatic structure of ice on the point of melting does not appear to have any connection with the hexagonal crystals in which it is formed; and that the great analogy between the conditions of ice in that state and of igneous rocks, and I may add of clay in the process of desiccation, seems to point to contraction as the common cause. But then arises the question whether ice really does contract as it approaches the melting-point, as we know that most melted mineral matter does on cooling, and clay on drying. I am quite willing to admit that it may do so, and that, as you observe, its demeanour at a point about 32° F. has not been accurately ascertained; but if so, the fact should first be determined from independent observations before drawing conclusions from it. I am willing also to admit that I spoke loosely in my former letter when I said that the air bubbles in the process of freezing seemed to be formed in vertical lines. My object, in the concluding sentence of that letter, was to express a doubt as to there being any such contraction as you suppose on the ice approaching the melting-point, and to point out the lines of air bubbles as being the immediate cause of the structure of rotten ice. I did not then go into the origin of the bubbles, or into the cause of their being thus found in vertical lines. It is difficult to suppose that they were originally formed in those lines, for though it seems natural that the air, which is always contained in water, should be excluded on its crystallising, there does not appear to be any sufficient reason why the bubble excluded to-day should be placed exactly under that formed yesterday. Upon reviewing the whole question, I am induced to think that, as will often happen, we were both right and both wrong: that you were right in attributing the prismatic structure originally to

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